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TECHNICAL INFORMATION SHEET 13

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GAS CYLINDERS – DECANTING GASES

1. INTRODUCTION

Decanting or trans-filling of gases is a specialist activity requiring competent people. The safe decanting of gases is a complex and lengthy procedure, requiring expertise and a high level of technical understanding. The issues raised in this publication are an outline of the major concerns that arise.

The decanting of gases carries an inherent potential for serious loss including the risk of significant personal injury, including death, and property damage. Decanting shall only be undertaken by appropriately trained personnel using suitable equipment.

Decanting gases also increases the probability of degrading the product quality to an unacceptable level, this aspect should be taken into account before starting any decanting operation.

2. SCOPE AND LIMITATIONS

The British Compressed Gases Association (BCGA) does not recommend the practice of decanting cylinders by unqualified persons, and therefore this document does not provide instruction on how to decant gases.

It does, however, recognise that some persons do undertake decanting activities irrespective of the dangers involved and therefore the aim of this document is to identify the appropriate regulations governing such practices and to highlight the main hazards associated with this operation. For more information and possible training contact the gas supplier or the training providers listed on the BCGA website.

3. DEFINITIONS

Decanting / Trans-filling	In this document decanting is the process of slowly transferring a gas between two or more cylinders. Decanting and trans-filling are intended to be one and the same.
Compressed Gas	Gas held under pressure.
Liquefied Gas	Liquid held under its vapour pressure.
Pressure system	Pipework with its protective devices to which a gas cylinder is or is intended to be connected.
Protective device	Includes any protective control or measuring equipment required to prevent a dangerous situation arising.

4. KEY MANAGEMENT REQUIREMENTS UNDER HEALTH AND SAFETY LEGISLATION

The Health and Safety at Work etc. Act (1) is the primary piece of legislation covering occupational health and safety, secondary legislation such as the Management of Health and

Safety at Work Regulations (7) cover the health and safety management of those involved in work activities and is the identification of the most frequent and serious risks, and adopting the right precautions based upon an assessment of those risks.

Current legislation (This list is not exhaustive)

The following is an outline of the current legislation that should be considered before considering any decanting activity.

Assess the risks to health and safety arising in or from decant operations and review these risks when there is significant change, refer to the *Management of Health and Safety at Work Regulations* (7). The Health and Safety Executive (HSE) provide guidance in HSG 65 (16), *Managing for Health and Safety*, with additional resource on their website, this shall be applied to decanting operations to ensure that best practice is employed and that associated legislation is considered.

Assess the risks to health from any hazardous substances being decanted. Ensure that information is provided to all those involved regarding the properties of the gas being used. Due regard is to be given to the requirements of the *Control of Substances Hazardous to Health Regulations* (10), any relevant equipment publications, manufacturers information and the product Safety Data Sheet.

Assess the risks arising from fire and explosion in line with the *Dangerous Substances and Explosives Atmospheres Regulations* (DSEAR) (11).

Ensure that the pressure system used in the decant process is designed, installed and constructed in accordance with the *Pressure Equipment Regulations* (8) and is maintained, as necessary in accordance with a written scheme of examination, as required by the *Pressure Systems Safety Regulations* (9).

Maintain the gas supply systems and gas disposal systems in a safe manner. *The Provision and Use of Work Equipment Regulations* (6).

Provide a safe means of disposal for the waste gas such that health and the environment are not damaged. *Environmental Protection* Act (2).

The work activity risk assessment will determine the requirement for the use of hazard controls, including Personal Protective Equipment (PPE). PPE may only be considered as a control to achieve an acceptable level of residual risk after other levels of control have been addressed. Where PPE is required a PPE Assessment is to be carried out. PPE is to be provided as required by the *Personal Protective Equipment at Work Regulations* (5). The PPE shall be selected for a particular task and location and shall be appropriate and chosen to effectively reduce the overall risk. Thus there are different PPE requirements for differing products, different tasks and possibly different personnel.

Assess manual handling activities. *Manual Handling Operation Regulations* (4).

It is a legal requirement to ensure that cylinders being filled comply with the detailed design, manufacture, inspection and test requirements given in the *Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations* (12), and that the filling is carried out by specially equipped centres with qualified staff using appropriate procedures.

All cylinders shall be marked and labelled to comply with the *Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations* (12) for transport, and European Regulation (EC) No. 1272/2008 *on the Classification, Labelling and Packaging of substances and mixtures* (15) for supply. For advice on labels and gas cylinder colours refer to BCGA TIS 6 (18), *Cylinder identification colour coding and labelling requirements*.

When not in use all gas cylinders shall be stored in an appropriate gas cylinder store. Refer to BCGA Guidance Note 2 (17), *Guidance for the storage of gas cylinders in the workplace.*

Information, instruction and training

All staff should have the necessary skills and knowledge to carry out their job safely and shall receive appropriate information, instruction and training, including induction and continuation / refresher training. Such training shall be both theoretical and practical. It is the duty of the employer to ensure their persons are adequately trained and to establish competency. It is recommended that a training programme is carried out under a formalised system where an acceptable level of competency has to be achieved. Records shall be kept of the information, instruction and training provided and of the competence level achieved. The programme shall make provision for periodic competence re-assessment.

It is recommended that those deemed competent to decant are authorised in writing. Adequate and appropriate supervision shall be provided.

All decanting operations shall be performed according to documented instructions which shall implement the controls identified by the risk assessment.

The information, instruction and training, shall also cover the actions to take in an emergency.

Accidents and emergencies

If an incident occurs during decanting operations, people may be exposed to serious and immediate danger. Written procedures are required for decant operations to deal with emergencies such as:

- serious injuries;
- explosion;
- poisoning;
- asphyxiation;
- fire;
- release of high-pressure gas;
- failure of equipment.

Particular reference should be made to *The Management of Health and Safety at Work Regulations* (7), *Health and Safety (First Aid) Regulation* (3), and for reporting of accidents and *incidents The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations* (14).

5. DECANTING ACTIVITIES

Hazards associated with decanting

Cylinders which are improperly filled can fail resulting in fatalities and severe personal injury, not only to the filler but to other personnel in the vicinity, as well as property damage. The correct filling of gas cylinders requires a high level of knowledge and expertise, particularly in the areas of gas properties, cylinder design, plant operation and relevant legislation.

The use of heater blankets, or other devices, for heating cylinders in an effort to increase the rate of fill is unsafe and lacks precise control. External heating equipment for the purposes of filling a cylinder shall not be used. Cylinders should be at ambient temperature during a fill cycle and shall always be maintained within the design limits for the cylinder material.

The use of equipment to keep a cylinder cool during filling is acceptable where the temperature is within the design limits of the cylinder (typically to -20 °C).

The decanting of liquefied gas involves the risk of over-filling with liquid leading to hydraulically full and over pressurised cylinders with the potential for catastrophic failure of the gas cylinder.

Decanting gases also increases the probability of degrading the product quality to an unacceptable level.

Cylinders and gas which SHALL NOT be decanted

Cylinders labelled as "disposable", "non-returnable" or "non-refillable" shall never be refilled or used as receiver cylinders for decant operations.

Within the UK, the supply of medical gases is regulated by the Human Medicines Regulations (13). For an organisation to fill gas cylinders to be used for medical use to treat patients (even for first aid use) they need to hold a Manufacturers and Importers Licence (MIA) issued by the Medicines and Healthcare products Regulatory Agency (MHRA). This licence covers all cylinder filling and supply activities as well as any quality control requirements. In addition, the licence holder shall have a Qualified Person available to formally certify and release any product supplied for patient use. The filling of medical gas cylinders shall be carried out under a Quality Management System that is compliant with the principles of Good Manufacturing Practice (GMP), as detailed in the EU GMP guidelines. All cylinders supplied shall be appropriately certified to demonstrate that they comply with the specification requirements detailed within European Pharmacopoeia monograph for the product. To be able to market and sell medical gases, the organisation shall also hold a Marketing Authorisation (MA) covering each specific gas supplied in the specific sized cylinders. The MA shall also detail all of the approved uses for the product and specify the correct means of administration.

Filling of acetylene cylinders is a complex and potentially dangerous process and shall never be attempted except in a properly designed acetylene plant. Acetylene when pressurised can become unstable and in its free state will decompose violently. The higher the pressure the smaller the initial force required to cause an explosion. For this reason acetylene gas is packaged into specially designed cylinders. These contain a porous mass and a solvent, which holds the acetylene in a safe form.

6. REFERENCES

1. The Health and Safety at Work etc. Act 1974

2. Environmental Protection Act 1990

3. SI 1981: No. 917 Health and Safety (First Aid) Regulations 1981

4. SI 1992: No. 2793 Manual Handling Operation Regulations 1992

5.	SI 1992: No. 2966	Personal Protective Equipment at Work Regulations 1992 (as amended).
6.	SI 1998: No. 2306	The Provision and Use of Work Equipment Regulations 1998
7.	SI 1999: No. 3242	The Management of Health and Safety at Work Regulations 1999
8.	SI 1999: No. 2001	The Pressure Equipment Regulations 1999 (as amended).
9.	SI 2000: No. 128	Pressure Systems Safety Regulations 2000
10.	SI 2002: No. 2677	Control of Substances Hazardous To Health Regulations 2002 (COSHH)
11.	SI 2002: N0. 2776	Dangerous Substances and Explosives Atmospheres Regulations 2002 - (DSEAR)
12.	SI 2009: No. 1348	The Carriage of Dangerous Goods and use of Transportable Pressure Equipment Regulations 2009 (as amended).
13.	SI 2012: No 1916	The Human Medicines Regulations 2012
14.	SI 2013: No. 1471	The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)
15.	European Regulation (EC) No. 1272/2008	The Classification, Labelling and Packaging of substances and mixtures.
16.	HSE HSG 65	Managing for Health and Safety
17.	BCGA Guidance Note 2	Guidance for the storage of gas cylinders in the workplace.
18.	BCGA Technical Information Sheet 6	Cylinder identification colour coding and labelling requirements.

For more information:

UK Legislation	www.legislation.gov.uk
Health and Safety Executive (HSE)	www.hse.gov.uk
British Standards Institute (BSI)	www.bsigroup.co.uk
British Compressed Gases Association (BCGA)	www.bcga.co.uk